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TITLE: **Current Practices for Monitoring Ammonia Slip from SCR Processes**

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ABSTRACT:

The retrofit of a Selective Catalytic Reduction (SCR) system into a coal-fired boiler usually causes some corresponding changes in the operation of the plant. One principal area is the measurement of ammonia from the SCR process and the observation of impacts the ammonia will have on the balance of plant operation and maintenance.

In this presentation, the authors will describe how existing utility plants in Europe and the United States have incorporated new procedures into daily plant operation to monitor ammonia in the system. The authors will also report how this information is used to assess the performance of the SCR system in maintaining NOx emission limits and to optimize SCR catalyst management.

SUMMARY:

Secondary NOx control by Selective Catalytic Reduction of NOx with ammonia in the presence of a catalyst is established as the state of the art technology to significantly

reduce emissions from utility boilers. The process itself is well-known and discussed in numerous publications.

Utilities having installed an SCR system are faced with the question of how to monitor and assess the system performance. This becomes important especially when a catalyst management plan has to be developed. Such a catalyst management plan provides a forecast for future catalyst need and projected time when to install or exchange catalyst. Taking into account that it may take some months for catalyst fabrication and delivery, it may become imperative to have this kind of information well in advance for discussions with the catalyst supplier and procurement.

It is also important to monitor free ammonia in the plant system so as to predict impacts on the balance of plant. Air heaters, in particular, are susceptible to pluggage due to the formation of ammonia bi-sulfate. As is well-known in the power industry, bi-sulfate formation is a function of free ammonia and sulfur trioxide concentrations in the flue gas. Monitoring ammonia in the system, downstream of the SCR, becomes an essential operating consideration.

Utilities in Germany did not have experience with SCR systems when these were installed in the 1980's. Over the years strategies were developed by the utilities together with the catalyst suppliers to monitor in-service performance and compare these data with results from catalyst samples analyzed in laboratory facilities. It is common practice for the supplier to provide a product surveillance plan for the installed catalyst. This provides valuable feedback information on catalyst behavior in the specific installation and is a basis for future catalyst assessment for other installations.

Owing to the incomplete reaction of ammonia with NOx, small amounts of ammonia leave the reactor with the flue gas. This effect, referred to as ammonia slip, is unavoidable. Ammonia slip rates start at very low levels and increase with decreasing catalytic activity. Deactivation is influenced by these factors: poisoning by trace elements; deposition of fly ash or sulfate compounds on the active sites; and aging, or rather a change of the catalyst pores. The loss of activity over time depends on the specific installation. The best indicator of activity loss is the increase in the ammonia slip. Certain problems must be overcome to accurately measure ammonia in the gas stream. First, the ammonia concentration range is very low; and, second, a single point measurement does not provide enough confidence in the result.

At this time, continuous, on-line ammonia measurement is not feasible, especially for coal-fired boiler applications. Utilities in Germany and the United States have adopted a quick and easy field process to monitor ammonia in the fly ash. Correlations with projected, and actual, catalyst deactivation and boiler operation yield accurate development of SCR operating trends and trouble-free NOx reduction.